Run-Off-Road Countermeasures

North Carolina DOT Traffic Engineering Conference for Operations & Safety

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Engineering / Operations

Major Contributing Factors to Fatalities

Factors Present in Crashes which Result in Fatalities:

- Single Vehicle Run-Off-Road - 38 %
- Intersections - 21 %
- Pedestrian and Bicyclist - 13 %

Total 72 %

(Source: 2000 FARS data)

Run-Off-Road

Problem:

- 38 % of all Traffic Fatalities
- 2/3 on 2-lane roads
- 1/2 at night

What is the problem?

- Nationally over 42,000 motorists are killed annually (**1,530 in NC 2001**)
- In North Carolina 512 of these fatalities are the result of a single vehicle run of the road
  - 149 persons are killed in collisions with trees/shrubs
  - 25 are killed after striking utility poles
- An additional 109 people are killed in one-car crashes vehicles overturns

Run-Off-Road Crashes - MICH Freeways

Based on review of:

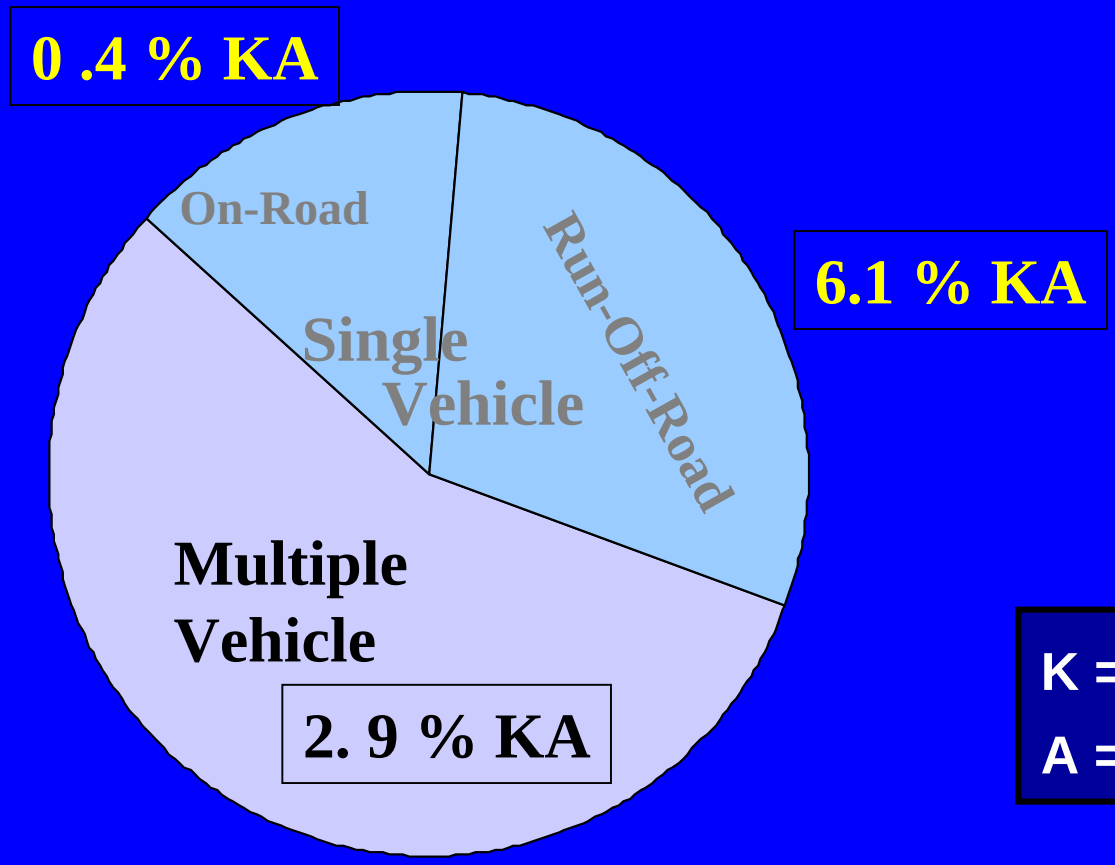
1887 crashes

784 miles

1996 - 2001

Michigan Freeway Crashes - Severity

1996 - 2001



K = fatality

A = incapacitating injury

34,000 crashes/yr

mainline

Michigan Freeway Crashes -Severity

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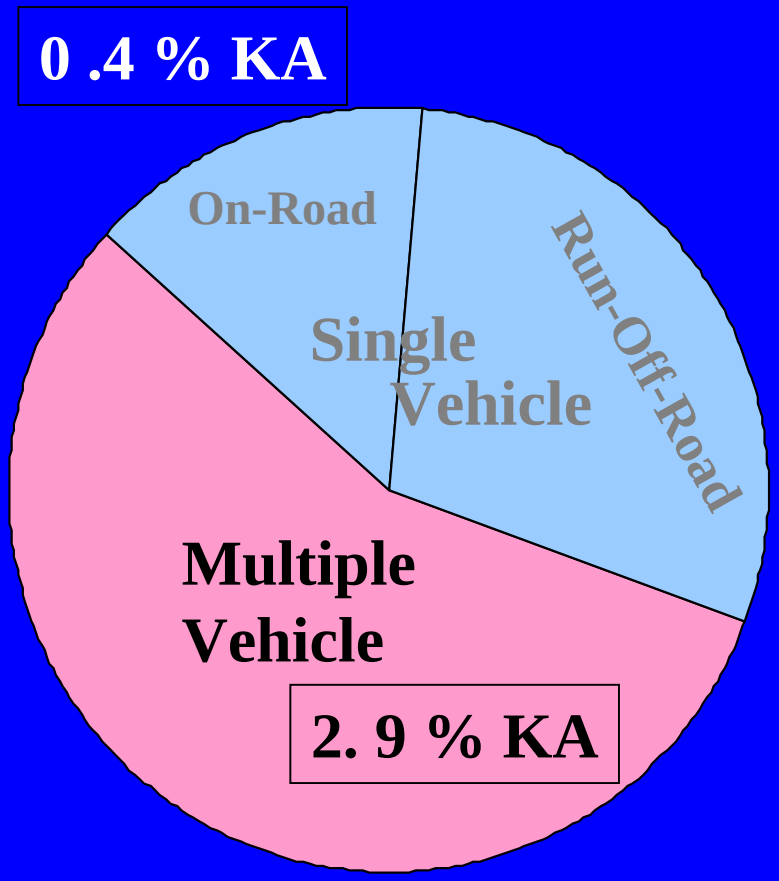

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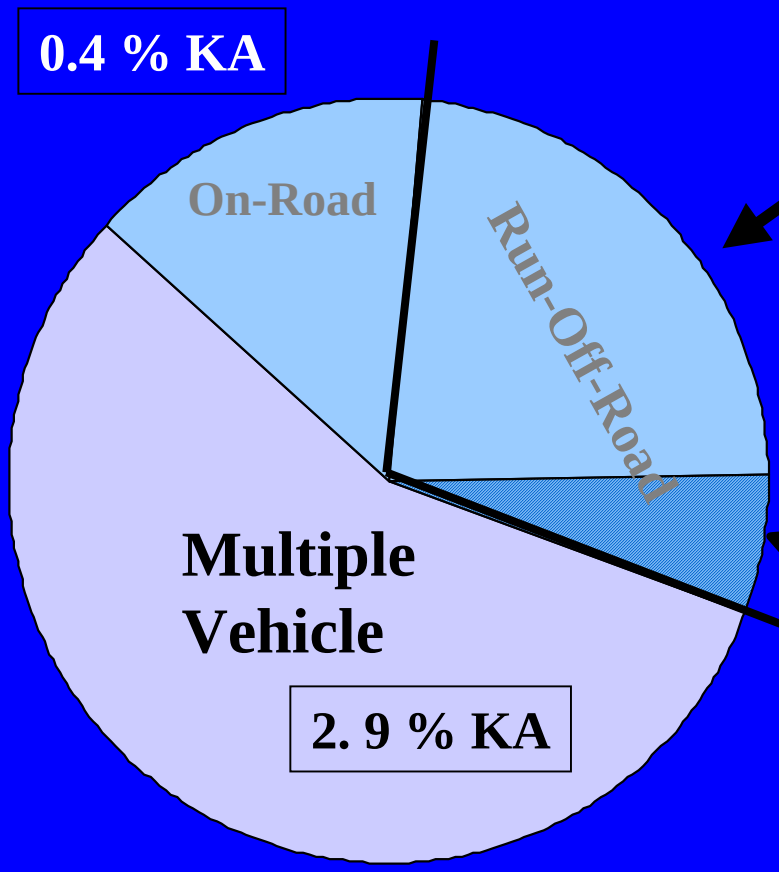

ice, snow on road	2.9% KA
wet road	3.4% KA
avoid veh, enter, exit, change lanes, passing	6.1% KA
Vehicle defect	5.8% KA

KNOWN DROWSY & DISTRACTED

17 % are KA

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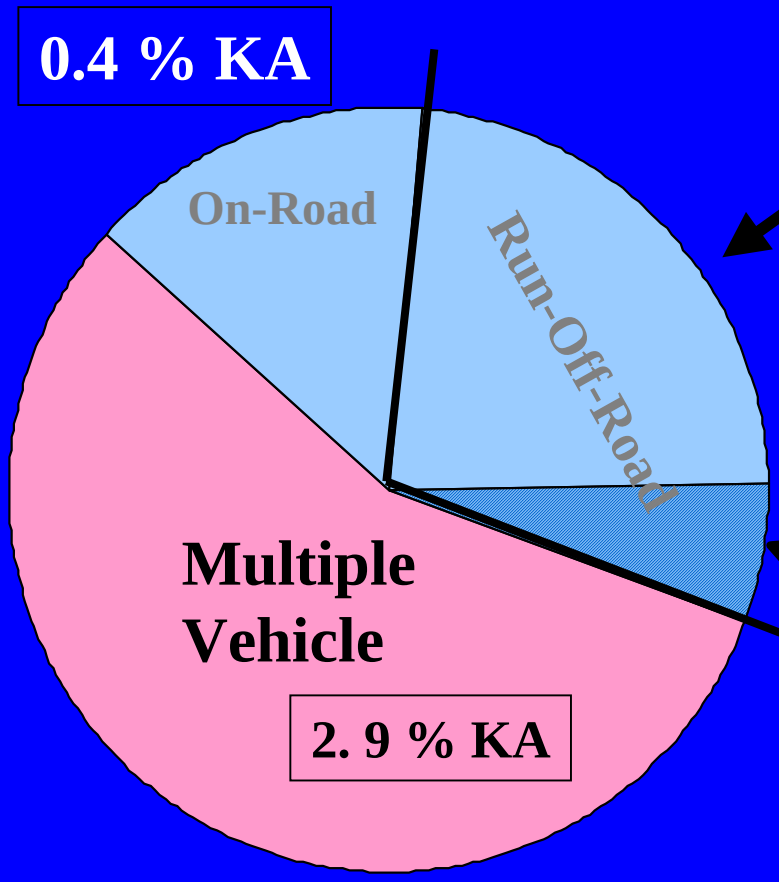

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Drift-off crashes are NOT:

- swerve to avoid another vehicle
- hydroplane
- swerve to avoid debris
- tire blowout
- trailer sway

Drift-off crashes are:

- Driver ASLEEP - 82%
- Driver DISTRACTED - 18%

Alcohol Involvement

Driver had been drinking in
21%

of all drift-off crashes

What can happen to a drift-off vehicle?

- recover (no crash) **???**

- parked vehicle **5 %**
- trees **14 %**
- signpost, light pole **6 %**
- guardrail, bridge rail **20 %**
- hit opposing vehicle **1 %**
- side slope, ditch **45 %**

Once a wheel drops off paved shoulder, drivers have difficulty controlling vehicle:

In 1794 crashes:

- **over-correct steering - 32 %**
- **rollover - 45 %**

Keeping motorists on the road is a priority

- Traditionally been done through the use of pavement markings – centerlines, lane lines, and edge lines
- Pavement markings are strictly visual and become ineffective during inclement weather, when worn out, or when a driver is distracted…

Rumble strips are intended to supplement pavement markings

- Adds sound and vibration to the visual benefits of painted markings
- Provide a drowsy, inattentive, or distracted driver with a clear warning that the vehicle has left travel lane…
- Provides some reaction time before the vehicle leaves the road

Pavement Marking Innovations
“Rumble Stripes”

Pavement Marking Innovations "Rumble Stripes"

- Also evaluated several different sized rumble strips and striping patterns over a 20 mile stretch of I-59 around Hattiesburg.

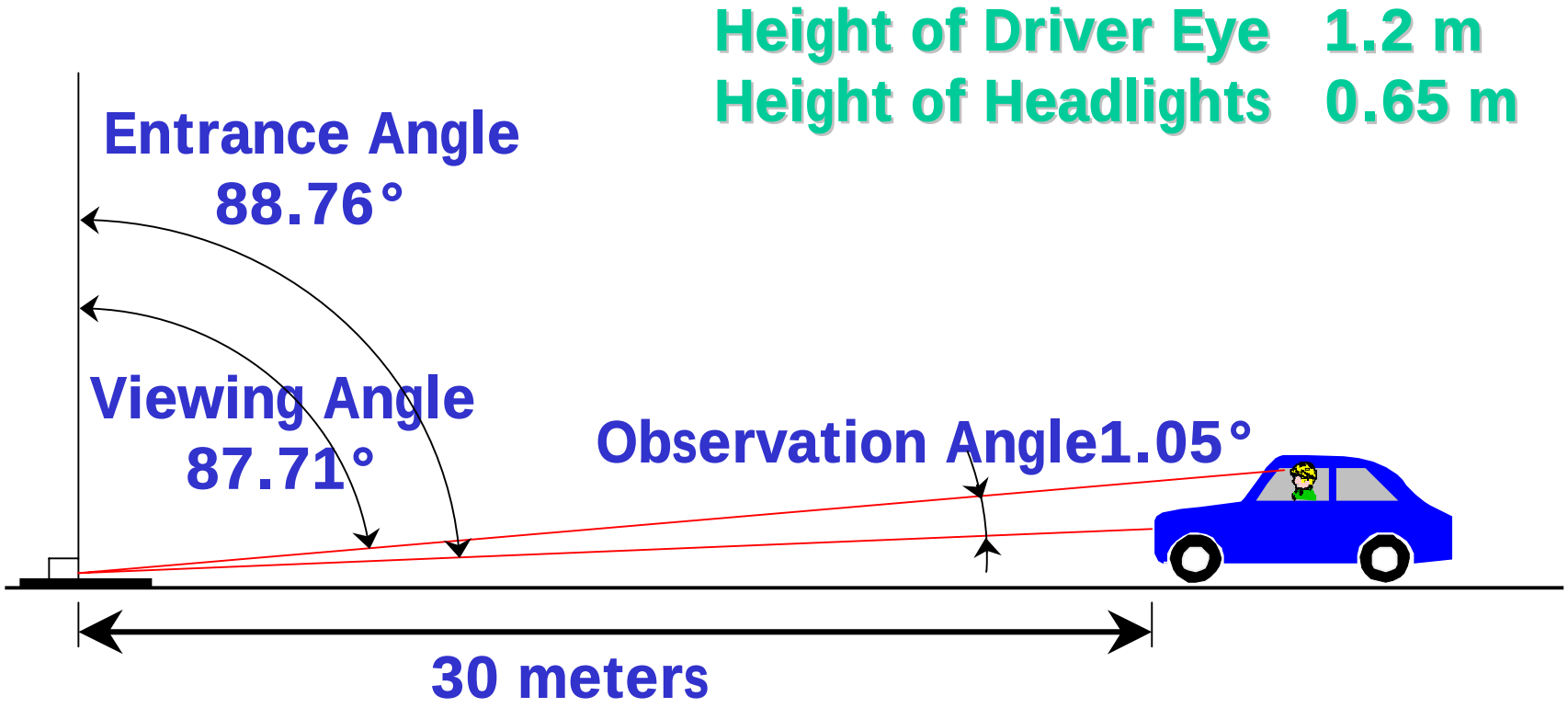
- 6", 9", 12", and the standard 16" rumble strips were installed with the edge stripe located in the rumble strip.

“Rumble Stripes”

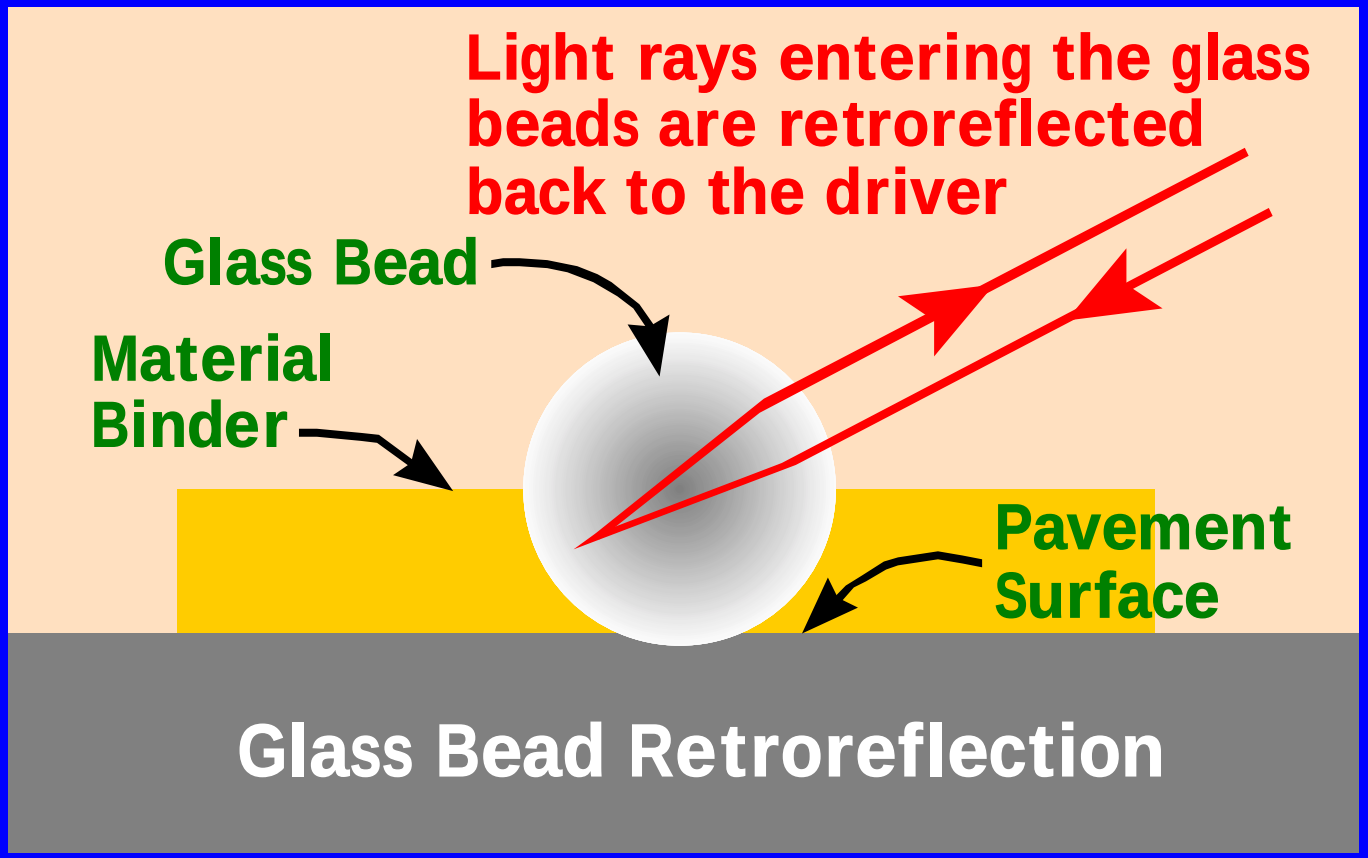
- The various rumble strips all produced satisfactory audible results.
- The 6” and 9” rumble stripes seemed to “pull” the vehicle somewhat.
- Delineation of the edge line was increased significantly due to the near vertical facing of the rumble strip.
- Produced results similar to RPM’s.

Pavement Marking Measurement

How much light is returned at given angles?



Pavement Marking Retroreflectivity



“Rumble Stripes”

- From the success of the I-59 project, MDOT is applying the rumble stripes to MS 589 (rural two-lane highway)

- 2 foot paved asphalt shoulder

Rumble Stripes on MS 589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Rumble Stripes on MS 589

Wet Weather Retroreflectivity

- In November 2002 Precision Scan measured the demo projects in Mississippi using the ASTM specifications for measuring wet weather retroreflectivity
- The values would fall into category 3 of the proposed definition for wet weather pavement markings

Rumble Stripes on MS 589

- Mississippi State University has been retained to do a survey to determine the impact of noise on the surrounding residents.
- With successful survey results, the rumble stripes could become a standard policy for MDOT.

Michigan Rumble Stripe Demo

- Michigan demonstrated a 5 mile Rumble Stripes project on the shoulder
- Currently in the process of placing an 85 mile project that will be evaluated

Dangerous Drop-Offs

- NEARLY 5 INCHES DEEP
- VERTICAL EDGE
- ONLY A SHORT DISTANCE


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Nature of Edge Rutting and Drop-Offs

- Edge rutting occurs on all sections of roads
- Usually a small percentage of road length
- Caused by errant vehicles and trees that shade the shoulder and prevent turf establishment in conjunction with erosion
- Common in curves and near turning movements
- Mailboxes

WHAT IS THE QUANTITY OF THE PROBLEM

- Georgia Tech did 68 case studies of fatal crashes in Georgia on 2 lane rural roads
- These crashes were not on the State Maintained System
- Drop-offs or edge rutting was present in 56% of the cases
- Of those cases, 50% were at mailboxes

Safety Pavement Edge Design

Safety Pavement Edge Design

- Helps errant vehicles to maintain stability particularly on roadway re-entry
- Edge of Pavement has a 45 degree shape
- Effective up to 5 inches of pavement depth
- Could be beneficial in reducing Tort Liability
- Demonstration project to look at construction feasibility